rate form a collection of papers and memorials on the protection of wild animals and plants, and on the present condition and future management of Epping Forest.

AT the recent examination for the Licence es Sciences Physiques in Paris, an English student, Mr. P. J. Hartog, B.Sc. Vict. Univ., passed first of the sixty-six candidates, though by three years the youngest of any.

DURING the latter part of this and the early part of next month a geographical congress and exhibition will take place in Douai. M. Ferdinand de Lesseps has been elected president. Belgium, Holland, Denmark, and Sweden will be represented.

THE United Steamship Association of Copenhagen has offered a free passage by their vessels to all Danish fishermen desirous of visiting the Fisheries Exhibition.

ON August 2, at about 10 p.m., a brilliant meteor passed from south to north over the town of Linköping in Sweden. When in the north-west it burst, spreading an intense pale blue light, and leaving a light smoke in the air which could be distinguished for several seconds. On July 23, at 10.15 p.m., a magnificent meteor was observed at Södertelje in Sweden. It went in a north-westerly direction, leaving a luminous track on the sky.

AS the representative of Sweden in the International Phytopathological Association, recently formed, Dr. J. Eriksson, botanist at the Academy of Agriculture, has been chosen. He is now engaged in collecting statistics and examples of diseases of plants, which it is the object of the Association to study and eradicate.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus* ♂) from India, presented by the Hon. Mrs. Pigott Carleton; two Maholi Galagos (*Galago maholi*) from South Africa, presented by Dr. Hugh Exton; a Rude Fox (*Canis rudis*) from Demerara, presented by Mr. Clement J. Bateman; a Suricate (*Suricata zenik* ♀) from South Africa, presented by Mr. Chas. H. Wootton; a Collared Peccary (*Dicotylès tajaçu*) from South America, presented by Mr. Fritz Zurcher; three Peregrine Falcons (*Falco peregrinus*), European, presented by Mr. J. Snowdon Henry, F.Z S.; two Javan Adjutants (*Leptoptilus javanicus*) from Java, two Indian Tantalus (*Tantalus leucocephalus*) from India, presented by the Hon. W. H. Ravenscroft; a Sclater's Curassow (*Crax sclateri* ♀) from South America, presented by Mr. John Ardran; a Wood Owl (*Syrnium aluco*), British, presented by Mr. G. Carrick Steet; two Ring-tailed Lemurs (*Lemur catta*) from Madagascar, a Black Bear (*Ursus americanus* ♂) from North America, a Greater Sulphur-crested Cockatoo (*Cacatua galerita*) from Australia, deposited; three Indian Pythons (*Python molurus*) from India, purchased; two Mule Deer (*Cariacus macrotis*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

THE SATELLITES OF SATURN.—Dr. W. Meyer has published corrected, or what he calls definitive, elements of the satellites *Enceladus*, *Tethys*, *Dione*, *Rhea*, *Titan*, and *Japetus*, chiefly founded upon his observations at the Observatory of Geneva in 1881, the mean motions however being determined from a comparison of the Geneva observations with the elements assigned by Jacob from measures of the satellites made at Madras during the years 1856-58. The mean distances and periods resulting from Dr. Meyer's investigations are as follow:—

	Mean distance in equatorial radii of Saturn.	Period.			
		d.	h.	m.	s.
Enceladus	3·8661	1	8	53	6·92
Tethys	4·8116	1	21	18	25·62
Dione	6·1629	2	17	41	9·29
Rhea	8·6082	4	12	25	11·57
Titan	19·9111	15	22	41	23·16
Japetus	57·9303	79	7	49	24·84

The other elements of the orbit of the outer satellite *Japetus* are subjoined; those of Jacob are added for comparison. Meyer's epoch is 1881 Nov. 0·0 G.M.T.; Jacob's is 1858 Jan. 0·0 G.M.T.

	Meyer.	Jacob.
Mean longitude	200° 8′ 53″	294° 31′·1
Longitude of peri-Saturnium	353 5 7	349 20
,, ascending node	142 17 27	143 1·3
Inclination to ecliptic	18 26 50	18 37·9
Eccentricity	0·028916	0·028443
Semi-axis major (for mean distance of Saturn)	514″·711	514″·96
Mean diurnal motion	4°·538273	4°·538042

TEMPEL'S COMET OF SHORT PERIOD (1873 II.).—Prof. Krueger, in transferring to the *Astronomische Nachrichten* the few positions lately given in this column, mentions that M. Schulhof of Paris, who has undertaken the calculations for the comet, promises an ephemeris in due course for that periodical.

THE BISCHOFFSHEIM OBSERVATORY AT NICE.—M. Perrotin, Director of the Observatory of Montgros, near Nice, lately founded by the munificence and scientific spirit of M. Bischoffsheim of Paris, has made an excellent beginning in the proposed work of that establishment. The Observatory is provided with a refractor of 15 inches aperture, and about 18 feet focal length, the object glass by MM. Henry of the Observatory at Paris, the mounting by Eichens and Gautier. This instrument M. Perrotin applied in June last to measures of a number of the more interesting double-stars, and amongst them several very difficult objects. The magnifying powers most frequently employed were 750 and 1000, with occasional use of 400 and 650. We make a short selection from M. Perrotin's results:—

Star.	Epoch.	Angle.	Distance.
42 Comæ Berenicis	1883·51	11°·5	0″·535
44 Böotis	— ·47	240·6	4·925
γ Coronæ Borealis	— ·53	138	(0 17 elong.)
ξ Scorpii	— ·52	11 5	1·16
ζ Herculis	— ·52	99·5	1·49
Σ 2107	— ·49	231·2	0·57
Σ 2173	— ·53	35 *e*	0·15 *e*
τ Ophiuchi	— ·51	252·1	1·66
70 ,,	— ·49	45·6	2·28
λ Cygni	— ·51	80·3	0·65

With respect to Σ 2173 M. Perrotin remarks that his results confirm M. Otto Struve's opinion that the star revolves in about forty-six years. The above measures of the rapid binary ζ Herculis are closely represented by Dr. Doberck's last orbit.

THE LATE TRANSIT OF VENUS.—The last number of the *Comptes Rendus* of the Paris Academy of Sciences is almost wholly occupied by the preliminary Reports from the various expeditions sent by the French Commission for the observation of this phenomenon, and one or two expeditions acting in co-operation with the Commission. The observations of contacts, &c., appear in these Reports. The stations included are Petionville, Hayti; Puebla, Mexico; Fort Tartenson, Martinique; St. Augustin, Florida; Santa Cruz, Patagonia; Cerro-Negro near San Bernardo, Chili; Chubut, Patagonia; Rio Negro (4h. 21m. 20s. W. of Paris and 40° 47′ 51″ S.); Hoste Island, Orange Bay, Tierra del Fuego; and Bragado, Buenos Ayres. It is gratifying to note the general success which attended these expeditions, even at the most southern station in Orange Bay, the latitude of which was 55° 31′ 28″.

A CONTRIBUTION TO THE STUDY OF THE TRANSMISSION EASTWARDS ROUND THE GLOBE OF BAROMETRIC ABNORMAL MOVEMENTS [1]

II.

WHEN the fact of these simultaneous movements is recognised, the irregularities in the transmission eastwards of the abnormal movements can be in great part explained. For instance, taking the movements B″ of the Zanzibar curve, it is found to recur at B′ and B in the Belgaum and Bombay curves after an interval of six months, that is to say, about one month longer than the average, and is moreover of much greater magnitude in these curves than at Zanzibar. But it is noticeable that in the month of November there was a very prominent simultaneous downward movement at the three stations, a movement which must have bent the curves very considerably out of the shape they would have taken had it not occurred, and it is allowable to suppose that the proper minimum in the Belgaum and Bombay curves corresponding to B'' of the Zanzibar curve took place in the month of October, 1881, that is to say, after the normal interval of five months, but was masked by the greater minimum in November, due to the simultaneous movement. Then again in the case of the maximum movement C, C', and C'', the period between C and C'' is, if five months be assumed to be the normal, quite regular; but between C' and C'' it is only four months, that is, one month shorter than usual. A reference to the dotted lines shows that in the month of January, 1882, all three curves were upheaved by a simultaneous movement, while in the following month they were all three depressed simultaneously. By the co-operation of these two simultaneous movements, the maximum C' was apparently quickened in its course by one month, and hence the irregularity. Again, with regard to the double oscillation D, D', and D'' (1 and 2) in the Zanzibar curve the first downward bend D''_1 is greater than the second D''_2; but in the Belgaum curve they are very nearly equal, and in the Bombay curve the first is even less than the second. On glancing down at the Zanzibar curve for the month of April, it is observable that an upward movement took place then; and if it be supposed that the upward impulse was felt at all the three stations simultaneously; but that this impulse was not so great at Bombay and Belgaum as the downward impulse due to the travelling movement coming from Zanzibar, then the actual effect at those two stations would be the resultant of the two impulses, that is to say, a downward movement of less amplitude than would have occurred had there been no simultaneous movement in that month.

---

[1] Concluded from p. 356.

The apparent acceleration of the movement A, A', and A'' is susceptible of a similar explanation, though not quite so satisfactorily, and it may perhaps be admissible to reserve for it an explanation which will present itself hereafter.

The existence of these simultaneous movements seems not only to afford an explanation in great part of the irregularities observable in the eastward transmission of the travelling movements, but also to clear away an objection that was brought forward by Mr. E. Douglas Archibald to the acceptance as an established theory of the eastward movement of abnormal variations. He asked (*vide* NATURE, vol. xxiii. p. 400) "Why the barometric waves should commence on onr meridian rather than one another." Now it is very noticeable (if a reference be made to the curves) that all the marked features of the curves—those features that are transmitted eastwards—occur in months when there are simultaneous movements at all the three stations, that in fact the simultaneous movements are the initial ones. And in the light of this fact the answer to Mr. Archibald's objection is that they do not commence on one meridian rather than on another, but (so far at any rate as the three stations under consideration are concerned) on all meridians simultaneously. But it is likely enough that they may be greater on one particular meridian, or at one particular point on that meridian, than on those on either side of, or about it, that in fact they result from a slight heaping up or withdrawing of the atmosphere over, or from, one part of the earth's surface, in which case the heap, or depression, will have its greatest altitude or depth at one particular place, but of course will be felt over a more or less considerable area around that place, and the degree in which it will be felt will be less as the length of the radius from the centre is increased. And that this is not altogether a fanciful idea is apparent on a reference being made to the smoothed curves, when it will be observed, for instance, that in July, 1880, and also in June, 1881, the upward movements were much greater at Bombay, the most northern of the three stations, than at Belgaum, a more southerly one; and at this, again, they were much greater than at Zanzibar, the most southern.

Mr. Archibald brings forward another objection. He asks: "If, as Mr. Chambers thinks, the waves of pressure travel slowly round the earth, why they do not reappear at the place where they started, after an interval of about one year and eight months (calculated from the lags given in Mr. Chambers's paper). At present there does not appear to be the slightest evidence that they reappear at all, and if they do not, when and where do they disappear?" One answer to this question is that they must, in the course of their eastward journey, get completely masked by other simultaneous movements of the atmosphere that are constantly taking place. Another answer to this question, and the one not requiring the supposition of the simultaneous movements, is that, as the travelling waves get further away from the place of their origin, and consequently widen out, their amplitude gets constantly less, until at last, like the waves caused by dropping a stone in a pond, they become imperceptible. If it were possible to eliminate the effect of the simultaneous movements, and examine only the curve produced by the travelling waves, one might then see this gradual decrease in their amplitude as they proceeded along their journey. It is impossible, however, at present to separate the effects of the two movements. An alternative method, however, to eliminating the effect of the first-mentioned movements is to pick out a period during which they were small or imperceptible. If such a period can be found, it will then doubtless be possible in some degree to trace the comparatively undisturbed action of the travelling movements. Such a period occurred from March to August, 1882, during which time the simultaneous abnormal movements were not easily traceable. And it is then seen how the amplitude of the double oscillation D'' (1 and 2) of the Zanzibar curve has diminished at D' and D (1 and 2) of the Belgaum and Bombay curves.

Another question which may be raised with regard to the matter, and a question which is not so easily answered is, why these waves should travel in an easterly direction and not in a westerly? It would be imagined that they should be transmitted equally in both directions, or if they are transmitted in one direction rather than in the other, it should have been a westerly one; in which case their motion might have been accounted for readily enough by supposing the atmosphere to lay behind in equatorial regions in a westerly direction due to the influx of air of a lower velocity from the polar regions; and perhaps also by supposing the sun to exercise an influence in the matter. The fact is, however, that the motion is in the same direction as, and ahead of, the earth's rotation. It would be interesting, however, to see if there is any evidence of a westward motion, and referring to the curves with this object in view, such evidence is perhaps discoverable. For instance, the simultaneous movement in July, 1880, causes a very marked upward bend of the Bombay and Belgaum curves; if, then, there is any motion westwards, this upward bend should make its appearance in some succeeding month in the Zanzibar curve; and, as a matter of fact, there is an upward movement shown by the dotted line in the month of September. It is difficult to find many instances of this westward transmission, owing to the somewhat intricate mixture of movements presented by the curves; but the following instances may be adduced as lending some support to the hypothesis: there is a simultaneous downward movement in May, 1880, and there is an independent downward movement at Zanzibar in the month of August in the same year, that is, three months later; there is again the instance already cited of the simultaneous upward movement of July, 1880, recurring at Zanzibar in September, that is, two months later. It may be that the excessive downward movement at Zanzibar in the month of March, 1881, was in part due to the recurrence there of the simultaneous movement which occurred, especially developed at Bombay, in January of the same year; that is, two months before. Again, the very large downward movement at Zanzibar in October and November, 1881, may have been in part due to the arrival there from Bombay and Belgaum of the wave produced by the simultaneous downward movement which occurred in August, two and a half months earlier. And lastly, two instances less difficult to trace, owing to the absence of any marked simultaneous movements during the period of their occurrence, are the upward and downward movements at Zanzibar of the months April and May, 1882, which may be regarded as due to the arrival there from the west of India of the waves resulting from the simultaneous impulses received at all stations in January and February of the same year; that is, at periods of three months for each.

And here may be given the explanation previously referred to of the apparent acceleration in the rate of movement of the wave A, A', and A''. It is possible that A and A' may not be due to the arrival at Bombay and Belgaum of the maximum A'', but of the wave caused by the simultaneous movement which occurred in July six months before, a period much nearer the normal than are the periods three and three and a half months; in which case the maximum A'' would be due to the arrival at Zanzibar from Bombay and Belgaum of the wave caused by the simultaneous movement in July, 1880, together with the simultaneous movement of October, 1880.

If this be a correct analysis of the curves, then there is the remarkable fact to be noted, that the motion of these waves in a westward direction takes place at an average rate of two and a half months, that is to say, twice as rapidly as in the eastward direction. And this fact would readily accord with the supposed westward lagging of the atmosphere due to its inertia; and also with any supposed influence of the sun. The presence of this westward transmission is not so apparent, however, as that of the eastward. And whether it be present or not, there still remains the difficulty, substantially the same as at the outset, that the motion eastwards is by far the most defined and most readily traceable; a difficulty for which I cannot even guess at any solution. Facts, however, should not be overlooked because they cannot be explained, but rather an explanation sought; and in the explanation of this fact theoretical matters of considerable interest may perhaps be involved. The only hints at any facts which might by any possibility suggest an explanation are to be found in Mr. Chambers's summary of his discovery, where he speaks of the direction eastwards being like that of "the cyclones of extra-tropical latitudes"; and in the very interesting and more suggestive statement of Dr. Balfour Stewart (*vide* NATURE, vol. xxii. p. 151), in which he says, speaking of terrestrial magnetism, "that we have some evidence which leads us to suspect that particular states of declination range, like particular states of weather have a motion from west to east, the magnetical moving faster than the meteorological."

As to the cause of these widely-distributed simultaneous movements of the barometer, movements which I consider to be in the main the initial impulses of the complication of abnormal movements visible in the curves, I have no evidence of any value. The most natural idea is that a connection, direct or indirect, may be traced between them and changes in the state of solar energy; the downward movements perhaps being due to an excess of energy, and the upward movements to a deficiency. In some points, perhaps, they may bear analogy to magnetic storms. I have not a sun-spot curve for the years under consideration, and cannot therefore make the necessary comparisons.

As a working hypothesis to serve as a guide in further investigating the matter, I should be inclined to suppose that the atmosphere, if it could, without stopping the earth's motion, be divested of its regular diurnal and seasonal movements, and the eddies and storms resulting therefrom, would present to observation a somewhat intricate mixture of motions consisting of the following elements:—

1. Certain initial movements, resulting mediately or immediately from changes in the state of the sun's energy, and affecting very wide areas, and being of the form of heapings up or drawings away of the atmosphere over these areas, the movements attaining their maximum height or depth at the centre of these areas. The centres of these areas would be immediately under the sun, that is to say, within the tropical latitudes.[1]

2. Waves resulting from the propagation in eastward and westward (and perhaps, though in a less marked degree northward and southward) directions of the impulses given by the first movements; the waves which travel eastward being for some unexplained reason more pronounced than those travelling westward, but their rate of motion over the earth's surface being, on account of the rotation of the earth and the atmosphere's inertia, slower in the eastward direction than in the westward.

3. Small local movements over more limited areas resulting from the chance conjunction and interference of any two or more of the first and second movements.

An extensive and detailed examination of the barometric records of stations scattered over the globe will bring to light facts either favourable or unfavourable to this hypothesis; and after this examination has been made, it will then be time to decide whether or not it is worth while undertaking the labour of dealing with the subject mathematically.

The matter seems important even theoretically, for in it and investigations of a like kind are to be found attempts at a rational arrangement of the very complex collection of facts contained in the various records of barometric abnormal movements; and practically also, for on the results of further investigation into it depends the confirmation or dismissal of a hypothesis which has given promise of furnishing a useful method of weather forecasting.

A. N. PEARSON,
Acg. Meteorological Reporter for Western India

Bombay, January 10

SCIENCE IN RUSSIA

THE Kieff Society of Naturalists was opened in 1869, and soon had more than a hundred members, mostly belonging to the University. Like other Societies of Naturalists at the Russian Universities, its chief aim has been the exploration of Russian natural history in the neighbouring provinces, these explorations proving that though the region around the Dnieper was not quite unknown in its geological, botanical, and zoological aspects, still there were wide lacunæ to be filled up before arriving at a thorough knowledge of it. Prof. Feofilaktoff, who had already published a geological map of the province of Kieff, assisted by several young geologists, busily explored, therefore, the surrounding provinces, especially on the right bank of the Dnieper, and published in the *Memoirs of the Kieff Society* a series of valuable papers on the Cretaceous, Tertiary, and post-Tertiary of the region, as well as on brown coal on the Dnieper. The Phanerogamic flora of the Dnieper region being sufficiently well known from the former works of Professors Andrzeiovski, Trautvetter, Rogowicz, and several others, the chief attention of the Society has been devoted to the Cryptogamic flora; and numerous papers by MM. Borschoff, Plutenko, Wältz, Rishavi, Timofeeff, Ryndovsky, Moshinsky, and Sovinsky, on the algæ, mosses, lichens, and fungi of the Dnieper region, as well as of Caucasus, appeared in the *Memoirs*. In zoology the chief researches were directed towards the exploration of the invertebrate fauna of the Black Sea, and whilst M. Bobretzky thoroughly studied the Annelids of the Black Sea, M. Krichagain carried out special studies of the Copepoda, and M. Paulson studied the Crustaceans of the Red Sea, in order to compare them with those of the great interior sea of Russia and Turkey. Several valuable papers were published at the same time on the anatomy and physiology of animals and plants, whilst the researches in chemistry and physics which were made at the Kieff University were mostly sent for publication to the *Journal of the Russian Chemical and Physical Society* at St. Petersburg.

Finally, the Kieff Society has undertaken, since 1873, the yearly publication of a most valuable systematic catalogue of papers in mathematics, in natural science, pure and applied, and in medicine, published throughout Russia in the numerous scientific publications which have grown up during the last ten years. These catalogues, which have reached during the last few years the size of large octavo volumes two hundred pages in extent for natural sciences and the same for medicine, are most valuable, as the number of provincial publications rapidly increases in Russia, and scientific papers of great value are virtually buried among the publications of the statistical committees, provincial assemblies, local scientific societies, and so on. The last (tenth) volume of this catalogue contains an index for the whole series of ten volumes.

The two last volumes of the *Memoirs* (*Zapiski*) *of the Kieff Society of Naturalists* (vols. v. and vi. 1879-1882) contains, like the preceding ones, a good many valuable papers. In geology we find several papers by Prof. Feofilaktoff and Schmalhausen. According to the former, the Eocene formation of the region has its central parts in the Government of Kieff, on the banks of the Dnieper. It consists of two series of deposits, the sandstones and sands of Traktemiroff, which only contain remains of Mollusks; and the Spondylus deposits which cover the former, and consist of sands, Spondylus clay, and greenish sands with plants (vol. v. fasc. 2). These plants, according to M. Schmalhausen's researches, which will soon be published by the Society, are the Alga *Chondrites*, similar to the Eocene *Chondrites Targionii*; a Conifer similar to the *Araucarites Duchartrei*; fruits of *Nipadites*, similar to those of the London clay; and pieces of Coniferæ and Palms and of a Bromelite (*Br. Dolinskii*, Schmalh.), fruits of tropical Leguminosæ (*Leguminosites Rogowiczi* and *L. Feofilaktowi*), and leaves of *Ficus prisca*. All these plants have been found in the upper parts of the clay, whilst in the sands that cover it M. Schmalhausen found a great number of stems and leaves of marine Monocotyledons, such as *Caulinites Rogowiczi* (a new species akin to the *Caulinites parisiensis*), and a new species of *Zorterites*, as well as parts of a new species of Graminea, *Polocapyrum incertum* (vol. vi. *Pro-*

---

[1] Mr. H. F. Blanford's discovery of "a barometric see-saw between Russia and India in the sun-spot cycle" (*vide* NATURE, vol. xxi. p. 477) seems to support this hypothesis.